**THAT WHICH IS CLAIMED IS:**

1. A method of enhancing fuel-stimulated insulin secretion in a subject, comprising administering to the subject a compound that modulates lactate dehydrogenase (LDH) activity in an amount effective to modulate LDH activity, thereby enhancing fuel-stimulated insulin secretion.

2. The method of Claim 1, wherein the compound modulates LDH activity in the cytoplasm.

3. The method of Claim 1, wherein the compound modulates LDH activity within the mitochondria.

4. The method of Claim 1, wherein the method comprises a method of enhancing glucose-stimulated insulin secretion.

5. The method of Claim 1, wherein the compound enhances LDH activity.

6. The method of Claim 5, wherein the compound is an LDH activator.

7. The method of Claim 1, wherein the compound is a polypeptide.

8. The method of Claim 7, wherein the compound is an antibody that binds to LDH.

9. The method of Claim 1, wherein the compound is a nucleic acid molecule.

10. The method of Claim 9, wherein the compound is a DNA molecule.

11. The method of Claim 9, wherein the compound is an RNA molecule.

12. The method of Claim 11, wherein the compound is selected from the group consisting of an antisense RNA, an inhibitory RNA (RNAi) and a ribozyme.

13. The method of Claim 1, wherein the subject is a human subject.

14. The method of Claim 1, wherein the subject has impaired glucose tolerance.

15. The method of Claim 14, wherein the subject has been diagnosed with diabetes mellitus.

16. The method of Claim 14, wherein the subject is obese.

17. The method of Claim 1, wherein the compound is identified by a process comprising:

contacting a LDH polypeptide with a test compound under conditions whereby modulation of the activity of the LDH polypeptide can be detected; and

detecting modulation of the activity of the LDH polypeptide, thereby identifying a compound that can modulate fuel-stimulated insulin secretion.

18. The method of Claim 1, wherein the compound is identified by a process comprising:

introducing a test compound into a cell that comprises LDH polypeptide under conditions whereby modulation of the activity of the LDH polypeptide can be detected; and

detecting modulation of the activity of the LDH polypeptide, thereby identifying a compound that can modulate fuel-stimulated insulin secretion.

19. The method of Claim 18, wherein the cell further comprises an isolated nucleic acid comprising a nucleotide sequence encoding LDH polypeptide and wherein the nucleotide sequence is expressed to produce LDH polypeptide.

20. The method of Claim 1, wherein the compound is identified by a process comprising:

introducing a test compound into a cell that is capable of producing and secreting insulin and which comprises LDH polypeptide under conditions whereby modulation of fuel-stimulated insulin secretion can be detected; and

detecting modulation of fuel-stimulated insulin secretion, thereby identifying a compound that can modulate fuel-stimulated insulin secretion.

21. The method of Claim 20, wherein the cell further comprises an isolated nucleic acid comprising a nucleotide sequence encoding LDH polypeptide and wherein the nucleotide sequence is expressed to produce LDH polypeptide.

22. The method of Claim 1, wherein the compound is identified by a process comprising:

administering a test compound to a transgenic non-human mammal comprising an isolated nucleic acid encoding LDH polypeptide operably associated with a transcriptional control element functional in pancreatic islet β-cells, wherein the isolated nucleic acid is stably incorporated into and expressed in pancreatic islet β-cells of the transgenic non-human mammal under conditions whereby enhancement of fuel-stimulated insulin secretion can be detected; and

detecting enhancement of fuel-stimulated insulin secretion in the transgenic non-human mammal, thereby identifying a compound that can enhance fuel-stimulated insulin secretion.

23. A method of identifying a compound that can modulate fuel-stimulated insulin secretion, comprising:

contacting a lactate dehydrogenase (LDH) polypeptide with a test compound under conditions whereby modulation of the activity of the LDH polypeptide can be detected; and

detecting modulation of the activity of the LDH polypeptide, thereby identifying a compound that can modulate fuel-stimulated insulin secretion.

24. The method of Claim 23, wherein the method comprises a method of identifying a compound that can modulate glucose-stimulated insulin secretion.

25. The method of Claim 23, wherein the test compound enhances the activity of the LDH polypeptide.

26. The method of Claim 23, wherein the test compound inhibits the activity of the LDH polypeptide.

27. The method of Claim 23, wherein the LDH polypeptide is a cytoplasmic LDH.

28. The method of Claim 23, wherein the LDH polypeptide is a mitochondrial LDH.

29. A method of identifying a compound that can modulate fuel-stimulated insulin secretion, comprising:

introducing a test compound into a cell that comprises lactate dehydrogenase (LDH) polypeptide under conditions whereby modulation of the activity of the LDH polypeptide can be detected; and

detecting modulation of the activity of the LDH polypeptide, thereby identifying a compound that can modulate fuel-stimulated insulin secretion.

30. The method of Claim 29, wherein the cell further comprises an isolated nucleic acid comprising a nucleotide sequence encoding LDH polypeptide and wherein the nucleotide sequence is expressed to produce LDH polypeptide.

31. The method of Claim 30, wherein the cell is stably transformed with the isolated nucleic acid.

32. The method of Claim 30, wherein the isolated nucleic acid comprises a nucleotide sequence selected from the group consisting of:

(a) a nucleotide sequence selected from the group consisting of the nucleotide sequence of SEQ ID NO:1, SEQ ID NO:3, SEQ ID NO:24 and SEQ ID NO:26;

(b) a nucleotide sequence that hybridizes to a nucleotide sequence selected from the group consisting of the nucleotide sequence of SEQ ID NO:1, SEQ ID NO:3, SEQ ID NO:24 and SEQ ID NO:26 or its complementary nucleotide sequence under stringent conditions, wherein said nucleotide sequence encodes a functional $LDH_A$ polypeptide; and

(c) a nucleotide sequence encoding an amino acid sequence encoded by the nucleotide sequences of (a) or (b), but which has a different nucleotide sequence than the nucleotide sequences of (a) or (b) due to the degeneracy of the genetic code or the presence of non-translated nucleotide sequences.

33. The method of Claim 32, wherein the nucleotide sequence encodes an amino acid sequence having at least about 70% amino acid sequence similarity to an amino acid sequence selected from the group consisting of the amino acid sequence of SEQ ID NO:4, SEQ ID NO:25 and SEQ ID NO:27 or a functional fragment of any of the foregoing.

34. The method of Claim 32, wherein the LDH polypeptide comprises an amino acid sequence selected from the group consisting of the

amino acid sequence of SEQ ID NO:4, SEQ ID NO:25 and SEQ ID NO:27 or a functional fragment of any of the foregoing.

35. The method of Claim 34, wherein the nucleotide sequence comprises a cDNA having the nucleotide sequence of SEQ ID NO:3.

36. The method of Claim 32, wherein the cell is selected from the group consisting of a pancreatic islet β-cell and an insulinoma cell.

37. A method of identifying a compound that can modulate fuel-stimulated insulin secretion, comprising:

introducing a test compound into a cell that is capable of producing and secreting insulin and which comprises lactate dehydrogenase (LDH) polypeptide under conditions whereby modulation of fuel-stimulated insulin secretion can be detected; and

detecting modulation of fuel-stimulated insulin secretion, thereby identifying a compound that can modulate fuel-stimulated insulin secretion.

38. A transgenic non-human mammal comprising an isolated nucleic acid encoding lactate dehydrogenase (LDH) polypeptide operably associated with a transcriptional control element functional in pancreatic islet β-cells, wherein said isolated nucleic acid is stably incorporated into and expressed in pancreatic islet β-cells of said transgenic non-human mammal.

39. The transgenic non-human mammal of Claim 38, wherein the non-human mammal is a mouse.

40. The transgenic non-human mammal of Claim 38, wherein the non-human mammal has impaired glucose tolerance.

41. The transgenic non-human mammal of Claim 36, wherein the LDH polypeptide is a human LDH.

42. A method of identifying a compound that can enhance fuel-stimulated insulin secretion, comprising:

administering a test compound to the transgenic non-human mammal of Claim 38 under conditions whereby enhancement of fuel-stimulated insulin secretion can be detected; and

detecting enhancement of fuel-stimulated insulin secretion in the transgenic non-human animal, thereby identifying a compound that can enhance fuel-stimulated insulin secretion.

43. A method of enhancing fuel-stimulated insulin secretion in a mammalian subject comprising, administering to the mammalian subject an isolated nucleic acid comprising a nucleotide sequence encoding lactate dehydrogenase (LDH) polypeptide in an amount effective to enhance fuel-stimulated insulin secretion.

44. The method of Claim 43, wherein the method comprises a method of enhancing glucose-stimulated insulin secretion.

45. The method of Claim 43, wherein the isolated nucleic acid encoding LDH polypeptide is delivered to pancreatic islet β-cells.

46. The method of Claim 43, wherein the LDH polypeptide is a cytoplasmic LDH.

47. The method of Claim 43, wherein the LDH polypeptide is a mitochondrial LDH.

48. The method of Claim 43, wherein the isolated nucleic acid comprises a nucleotide sequence selected from the group consisting of:

(a) a nucleotide sequence selected from the group consisting of the nucleotide sequence of SEQ ID NO:1, SEQ ID NO:3, SEQ ID NO:24 and SEQ ID NO:26;

(b) a nucleotide sequence that hybridizes to a nucleotide sequence selected from the group consisting of the nucleotide sequence of SEQ ID NO:1, SEQ ID NO:3, SEQ ID NO:24 and SEQ ID NO:26 or its complementary nucleotide sequence under stringent conditions, wherein said sequence encodes a functional $LDH_A$ polypeptide; and

(c) a nucleotide sequence encoding an amino acid sequence encoded by the nucleotide sequences of (a) or (b), but which has a different nucleotide sequence than the sequences of (a) or (b) due to the degeneracy of the genetic code or the presence of non-translated nucleotide sequences.

49. The method of Claim 43, wherein the nucleic acid further comprises a transcriptional control element functional in pancreatic islet β-cells and which is operably associated with a nucleotide sequence encoding LDH polypeptide.

50. The method of Claim 43, wherein the nucleic acid is administered to the subject in a delivery vector.

51. A method of treating non-insulin dependent diabetes mellitus, comprising administering to a subject afflicted with non-insulin dependent diabetes mellitus an isolated nucleic acid comprising a nucleotide sequence encoding lactate dehydrogenase (LDH) polypeptide in a therapeutically effective amount.

52. The method of Claim 51, wherein the subject is a human subject.

53. An isolated nucleic acid comprising a nucleotide sequence encoding a mitochondrial lactate dehydrogenase-A ($LDH_A$) polypeptide.

54. The isolated nucleic acid of Claim 53, wherein said isolated nucleic acid comprises a nucleotide sequence selected from the group consisting of:

(a) a nucleotide sequence selected from the group consisting of the nucleotide sequence of SEQ ID NO:3, SEQ ID NO:24 and SEQ ID NO:26;

(b) a nucleotide sequence that hybridizes to a nucleotide sequence selected from the group consisting of the nucleotide sequence of SEQ ID NO:3, SEQ ID NO:24 and SEQ ID NO:26 or its complementary nucleotide sequence under stringent conditions, wherein said nucleotide sequence encodes a functional mitochondrial $LDH_A$ polypeptide; and

(c) a nucleotide sequence encoding an amino acid sequence encoded by the nucleotide sequences of (a) or (b), but which has a different nucleotide sequence than the nucleotide sequences of (a) or (b) due to the degeneracy of the genetic code or the presence of non-translated nucleotide sequences.

55. The isolated nucleic acid of Claim 53, wherein said nucleotide sequence encodes an amino acid sequence having at least about 70% amino acid sequence similarity to an amino acid sequence selected from the group consisting of SEQ ID NO:4, SEQ ID NO:25 and SEQ ID NO:27 or a functional fragment of any of the foregoing.

56. The isolated nucleic acid of Claim 53, wherein said nucleotide sequence encodes an amino acid sequence comprising an amino acid sequence selected from the group consisting of SEQ ID NO:4, SEQ ID NO:25 and SEQ ID NO:27 or a functional fragment of any of the foregoing.

57. A vector comprising the isolated nucleic acid of Claim 53.

58. An isolated nucleic acid comprising a nucleotide sequence consisting essentially of a nucleotide sequence selected from the group consisting of the nucleotide sequence of SEQ ID NO:3, SEQ ID NO:24 and SEQ ID NO:26.

59. An isolated mitochondrial lactate dehydrogenase-A ($LDH_A$) polypeptide.

60. A tetrameric LDH comprising the $LDH_A$ polypeptide of Claim 59.

61. The isolated $LDH_A$ polypeptide of Claim 59, wherein said polypeptide comprises an amino acid sequence having at least about 70% amino acid sequence similarity to an amino acid sequence selected from the group consisting of SEQ ID NO:4, SEQ ID NO:25 and SEQ ID NO:27 or a functional fragment of any of the foregoing.

62. The isolated $LDH_A$ polypeptide of Claim 59, wherein said polypeptide comprises an amino acid sequence selected from the group consisting of SEQ ID NO:4, SEQ ID NO:25 and SEQ ID NO:27 or a functional fragment thereof.

63. An isolated $LDH_A$ polypeptide consisting essentially of an amino acid sequence selected from the group consisting of SEQ ID NO:4, SEQ ID NO:25 and SEQ ID NO:27 or a functional fragment thereof.

64. A cultured cell for use in a cell-based screening assay comprising the isolated nucleic acid of Claim 53.

65. A cultured cell for use in a cell-based screening assay comprising the isolated nucleic acid of Claim 58.

66. A cultured cell for use in a cell-based screening assay comprising the isolated mitochondrial $LDH_A$ polypeptide of Claim 59.

67. A cultured cell for use in a cell-based screening assay comprising the isolated mitochondrial $LDH_A$ polypeptide of Claim 63.